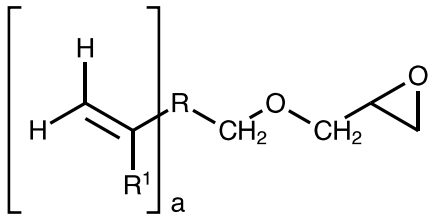
compounds. Stabilizers made from the isocyanate capping agents tend to be inconsistent in their composition and their performance. Polymer polyols made from these stabilizers are often less stable than is wanted. The presence of the amine and urea by-products also can interfere with the processing of the polymer polyols to produce polyurethane foam. It would be desirable to avoid these problems.

Epoxide compounds have been suggested for use in producing stabilizers for polymer polyols. *See, e.g.,* US 9,994,701, which mentions without further elaboration the possibility of using an unsaturated epoxide as a capping agent. US 5,059,641 describes epoxide-modified polyols as being useful stabilizers, but in this case neither the epoxide compound nor the stabilizer is unsaturated, and the stabilizer cannot copolymerize with the vinyl monomers during the manufacturing process.

This disclosure provides a process for making a polymer polyol, comprising polymerizing one or more low molecular weight ethylenically unsaturated monomers that have a molecular weight of no greater than 150 in a continuous liquid polyol phase and in the presence of a stabilizer to form a dispersion of solid polymer particles in the continuous liquid polyol phase, wherein the stabilizer includes (i) a macromer produced in a reaction of a hydroxyl-containing polyether with an epoxide compound having a polymerizable carbon-carbon double bond; (ii) a pre-formed polymer formed by polymerizing a carbon-carbon double bond of such macromer, or (iii) a mixture of (i) and (ii), wherein the epoxide compound is represented by structure I:



(I)

where a is a positive number, R is a covalent bond or an organic linking group and R^1 is hydrogen or hydrocarbyl group having up to 6 carbon atoms. These epoxide compounds can be understood as corresponding to a glycidyl ether of a CH_2=CHR^1-R-CH_2-OH compound.

In one aspect, the disclosure provides a process for making a polymer polyol, comprising polymerizing one or more low molecular weight ethylenically unsaturated monomers that have a molecular weight of no greater than 150 in a continuous liquid polyol phase and in the presence of 1.5 to 15% by weight based on the weight of the low molecular weight monomers, of a stabilizer to form a dispersion of solid polymer particles in the continuous liquid polyol phase, wherein the stabilizer includes (i) a macromer produced in a reaction of a hydroxyl-containing polyether with an epoxide compound having a polymerizable carbon-carbon double bond; (ii) a pre-formed polymer formed by polymerizing a carbon-carbon double bond of such macromer, or (iii) a mixture of (i) and (ii) wherein the epoxide compound is one or more of isopropenyl benzyl glycidyl ether and vinyl benzyl glycidyl ether.

In another aspect, the disclosure provides a polymer polyol made in accordance as defined herein.

In another aspect, the disclosure provides a polyurethane foam which is produced by reacting a polymer polyol as defined herein with an organic polyisocyanate in the presence of a blowing agent.

The applicant has found that many types of unsaturated epoxide compounds are unsuitable for use in making a macromer or stabilizer. Epoxy compounds which have two methylene groups bonded directly to the ether oxygen shown structure I have been

WHAT IS CLAIMED IS:

1. A process for making a polymer polyol, comprising polymerizing one or more low molecular weight ethylenically unsaturated monomers that have a molecular weight of no greater than 150 in a continuous liquid polyol phase and in the presence of 1.5 to 15% by weight based on the weight of the low molecular weight monomers, of a stabilizer to form a dispersion of solid polymer particles in the continuous liquid polyol phase, wherein the stabilizer includes (i) a macromer produced in a reaction of a hydroxyl-containing polyether with an epoxide compound having a polymerizable carbon-carbon double bond; (ii) a pre-formed polymer formed by polymerizing a carbon-carbon double bond of such macromer, or (iii) a mixture of (i) and (ii) wherein the epoxide compound is one or more of isopropenyl benzyl glycidyl ether and vinyl benzyl glycidyl ether.

2. The process of claim 1, wherein at least 75% by weight of the stabilizer is the macromer.

3. The process of claim 2, wherein at least 95% by weight of the stabilizer is the macromer.

4. The process of any of claims 1-3, wherein the hydroxyl-containing polyether is a random copolymer of a mixture of 84 to 90% propylene oxide and 10 to 16% ethylene oxide, based on the weight of the polyether.

5. The process of any of claims 1-4, wherein the macromer has a molecular weight from 8000 to 15,000.

6. The process of any preceding claim, wherein the macromer contains an average of 4 to 6 hydroxyl groups per molecule and 1 to 1.5 polymerizable carbon-carbon double bonds per molecule.

7. The process of any preceding claim, wherein the low molecular weight ethylenically unsaturated monomers include at least one of styrene and acrylonitrile.

8. The process of claim 7, wherein the low molecular weight ethylenically unsaturated monomers include styrene and acrylonitrile at a weight ratio of 85:15 to 50:50.

9. A polymer polyol made in accordance with any of claims 1-8.

10. A polyurethane foam which is produced by reacting a polymer polyol of claim 9 with an organic polyisocyanate in the presence of a blowing agent.